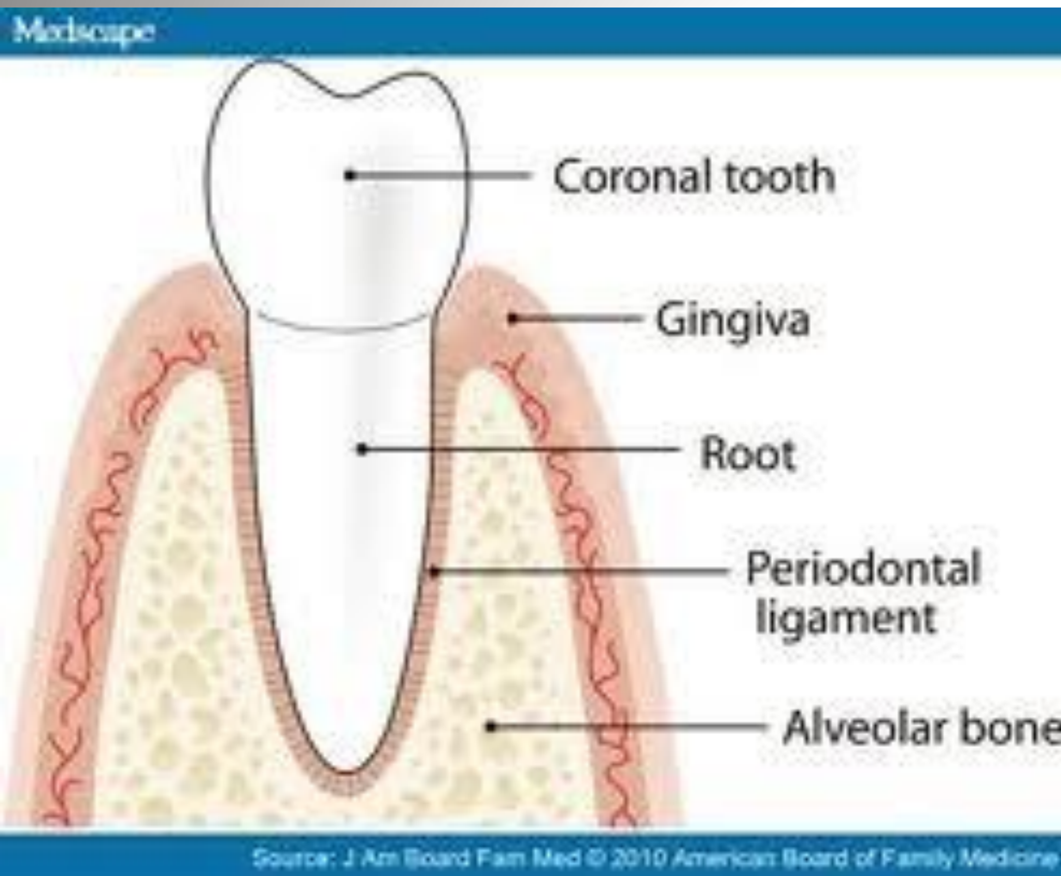
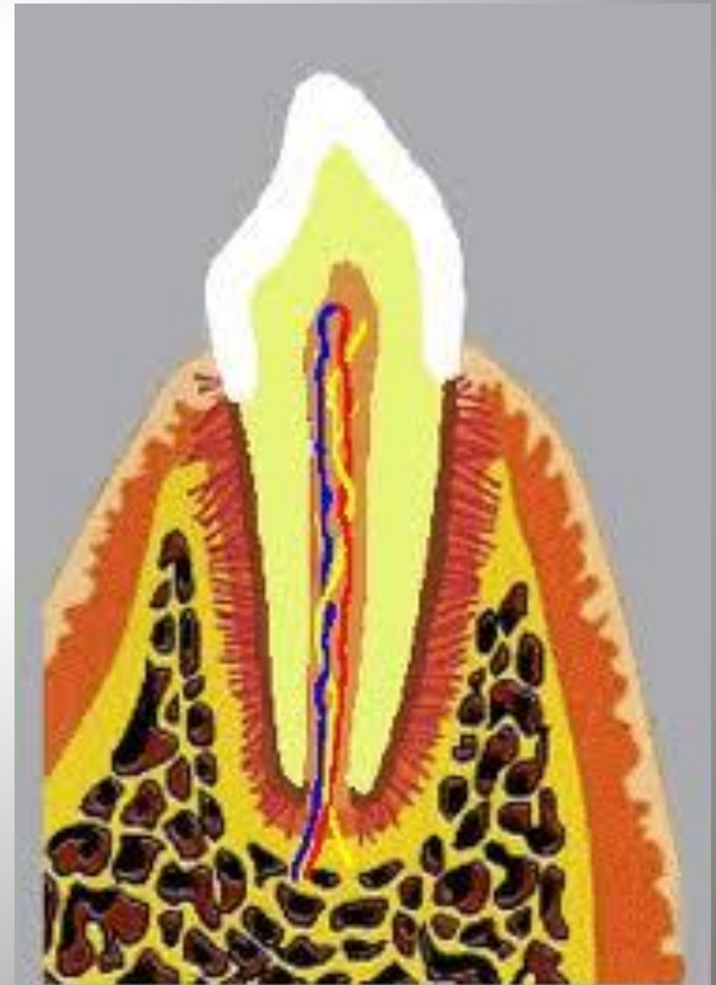
THE EPIDEMIOLOGY OF PERIODONTAL DISEASES

Periodontal disease is the affection of the periodontium tissues of the teeth.





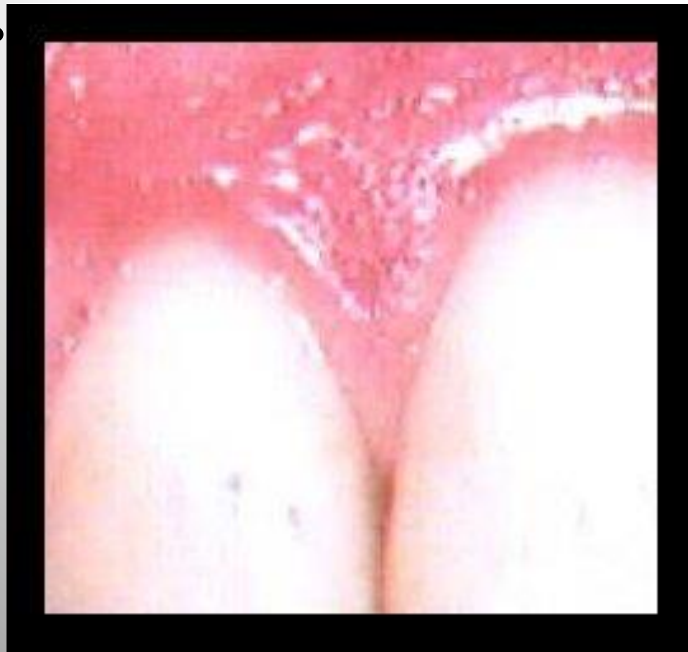
Normal gingiva appeared *pink*, *firm*, *stippled*, with well formed papillae and shallow gingival sulci (crevices) without exudates.

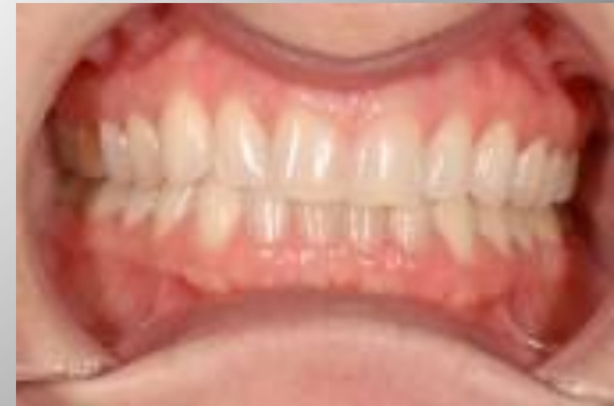
Gingiva composed of:

1- <u>Interdental papilla</u>.

2-M<u>arginal gingiva </u>(circumscribed the tooth)

3-<u>Attached gingiva</u> (bound to cementum and alveolar bone).





Indices Used For Assessment of Gingival and Periodontal Diseases

1- P.M.A. Index

2- The gingival Index (GI)

3- The periodontal index (Pl) Russel's Index

4- The oral hygiene index (OHI) and the oral hygiene index simplified (OHI-S)

5- Community Periodontal Index of Treatment Need (CPITN)

1- P.M.A. Index:

Is the first attempt to design a numerical system of recording gingival conditions.

The three letters stand for gingival papilla ***mesial*** to the tooth, i.e. ***papillary (P) marginal (M) and attached gingiva(A)***.

periodontal disease starts from the interdental papilla (P), spreads to the marginal area (M) and continues to the attached gingiva (A).

Thus ***all the present*** teeth are examined (sometimes this index would be confined to an area or quadrant).

The number of the affected P .M.A. units are counted, and considered 'as **separate estimates**.

Mild if (1 to 4 P) and (0 to 2 M) are affected

Moderate if (4 to 8 P) and (2 to 4 M) are affected

Severe if (more than 8 P) and (more than 4 M) are affected.

Involvement of attachments is associated with severe cases.

The average P.M.A. for the group is determined by totaling the number of gingival units affected and dividing by the number of cases under study.

2- The gingival Index (GI)

The severity of the gingival condition is indicated on a scale running from 0-3

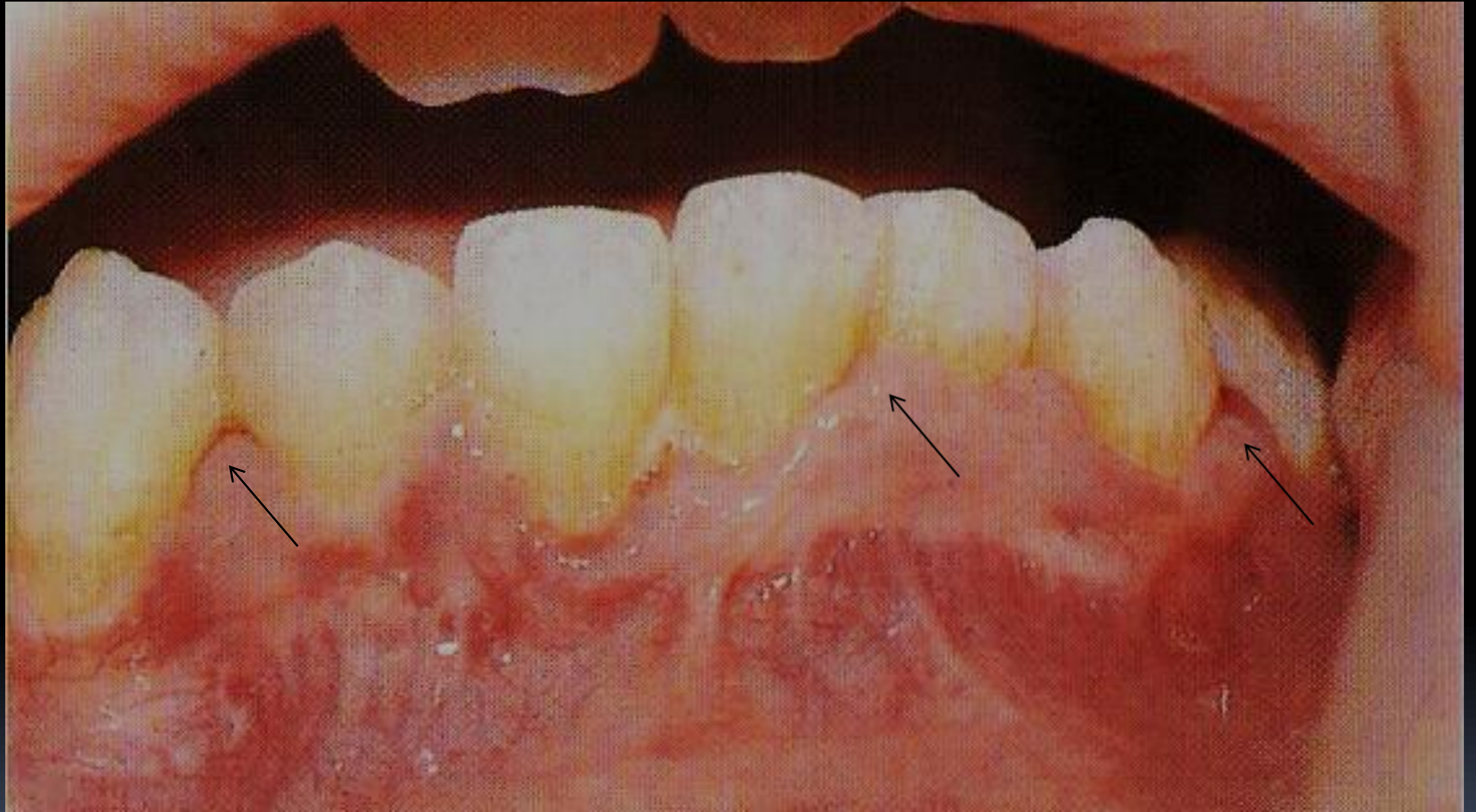
0: No inflammation

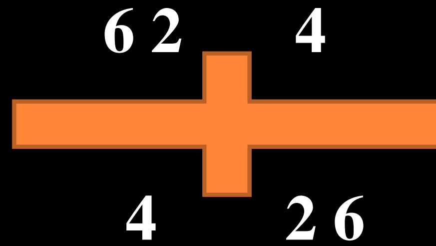
1: Mild inflammation: slight redness, slight edema, probing with a blunt probe do not result in bleeding.

2: Moderate inflammation: edema, redness, glazing the marginal gingiva is swollen, probing with a blunt probe elicit bleeding.

3: Severe inflammation: marked redness and edema, spontaneous bleeding and/or ulceration.

It is a partial recording system, six teeth are selected for the examination





For each of the six teeth, ***mesial, distal, buccal and lingual gingival unit*** is scored independently.

The tooth scores are summed and divided by 4 gives the gingival index of the tooth.

The scores of the 6 teeth are summed and divided by their number, given the GI of the individual.

3- The periodontal index (PI) Russel's Index

The criteria of the PI index are:

0: Negative: healthy gingiva.

1. Mild gingivitis: There is an obvious area of inflammation in the free gingiva, but this area does not circumscribe the tooth.

2. Gingivitis: inflammation completely circumscribes the tooth but there is no apparent break in the epithelial attachment.

6. gingivitis with pocket formation: The epithelial attachment has been broken, and there is pocket. There is no interference with normal masticatory function, the tooth is firm in its socket

***8. Advanced destruction with loss of masticatory function*:** the tooth may be loose, drifted, may have dull sound on percussion, may be depressive in its socket.

The author writes 6 after 2 since:

If the PI score of an individual is small (i.e. 1 or 2) this indicates that this individual has gingival affection but if it is high (6-8), this indicates that this individual has only periodontally affected teeth.

If the score is in-between 2 and 6, this indicates both gingival and periodontal disease. This index is most suitable for assessment of the gingival and periodontal condition in adult populations.

The Data of PI is computed by examination ***all the patient teeth***.

$$\textbf{PI of the individual} = \frac{\text{The teeth scores are summed}}{\text{teeth numbers}}$$

$$\frac{\text{The PI scores of individuals are summed}}{\text{numbers of individuals}} = \textbf{PI of group}$$

Lilienthal et al. (1964) ***modified Russel's classification of periodontal condition*** using **partial recording system** to be easier with large surveys.

The teeth used are

7	14
41	7

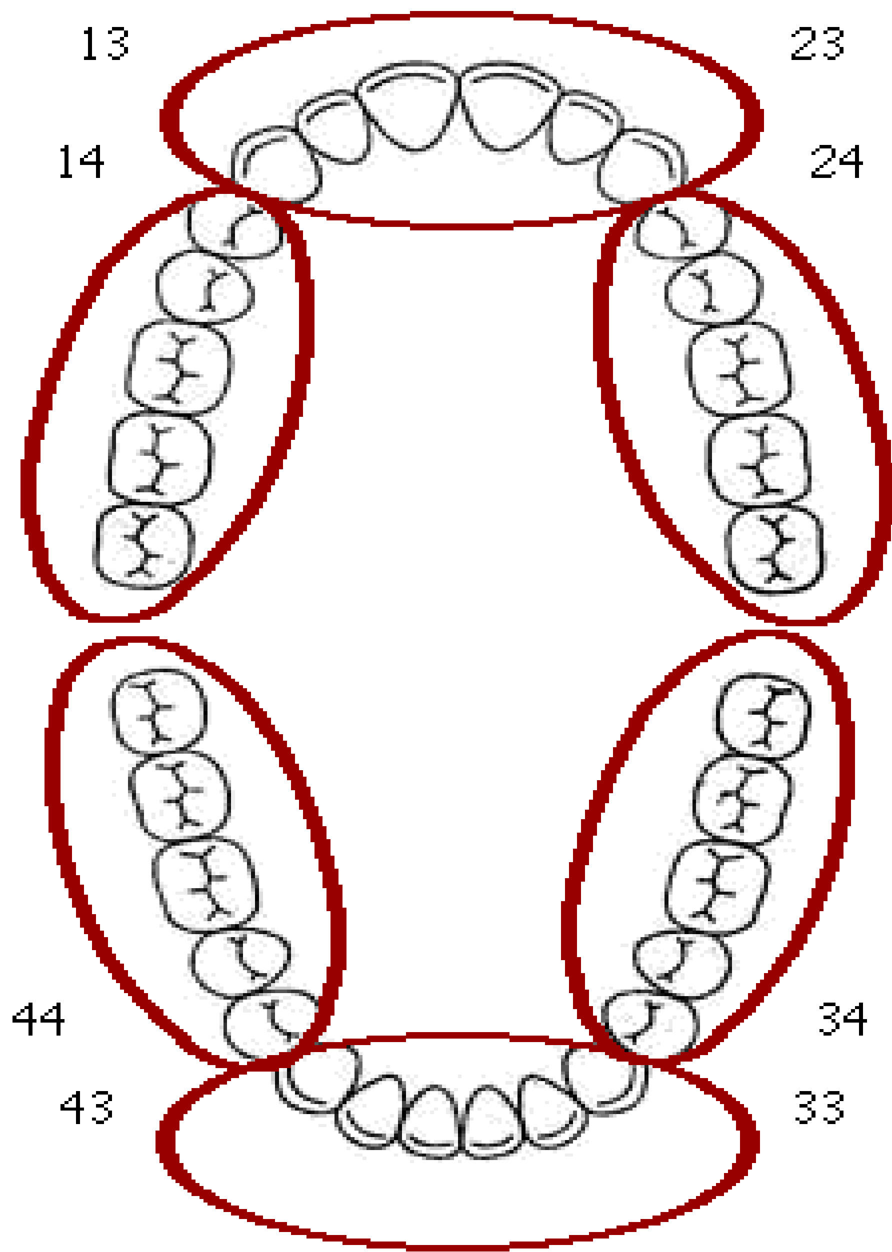
The authors take 7 instead of 6 due to the frequent loss of 6 due to caries.

4- The oral hygiene index (OHI) and the oral hygiene index simplified (OHI-S):

The criteria used to assign the scores to the tooth surface in the OHI-S are the same as those used for the OHI.

The OHI-S and the OHI have two components, the debris index **(DI)** and the calculus index **(CI)**.

Each of these indices ***representing the amount of debris and calculus formed*** on the selected surfaces.


segment 2
13
23
14
24
segment 1
segment 3
18
28
48
38
segment 6
segment 4
44
34
43
33
segment 5

For the OHI:

Each jaw is divided into 3 segments ***right posterior segment, anterior segment and left posterior segment***.

After examination, ***the worst tooth*** in each segment is taken as a representative of the segment.

The buccal and lingual surfaces of each tooth are scored. Therefore, the OHI comprises ***12 surfaces of six teeth***.

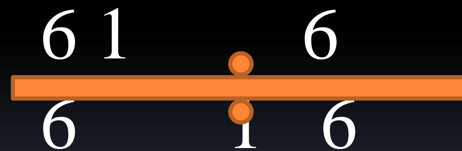
For the OHI-S:

The examination is limited to ***6 permanent tooth surfaces***.

*The **labial surface** of the upper right central incisor, lower left central incisors*,

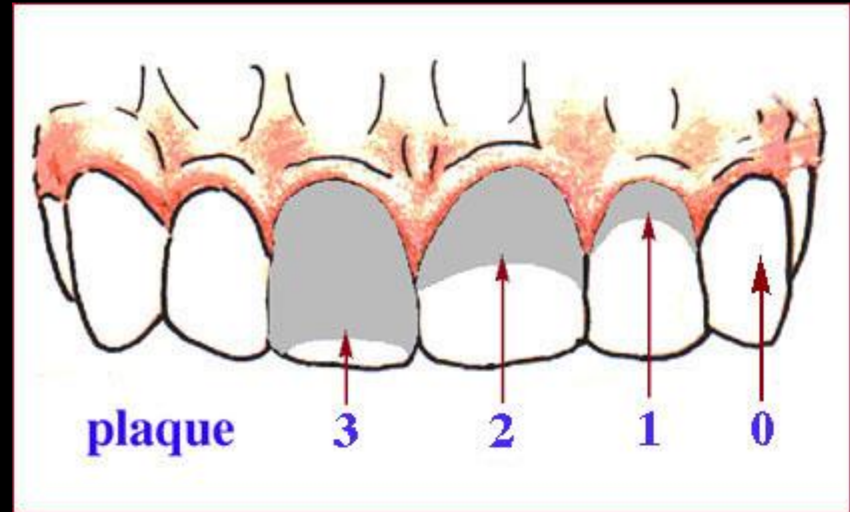
the buccal surfaces of the upper first permanent molars

and ***the lingual surfaces of the lower first permanent molars***.



When any of these teeth are missing, a comparable adjacent tooth is Substituted.

Only fully erupted teeth are scored.



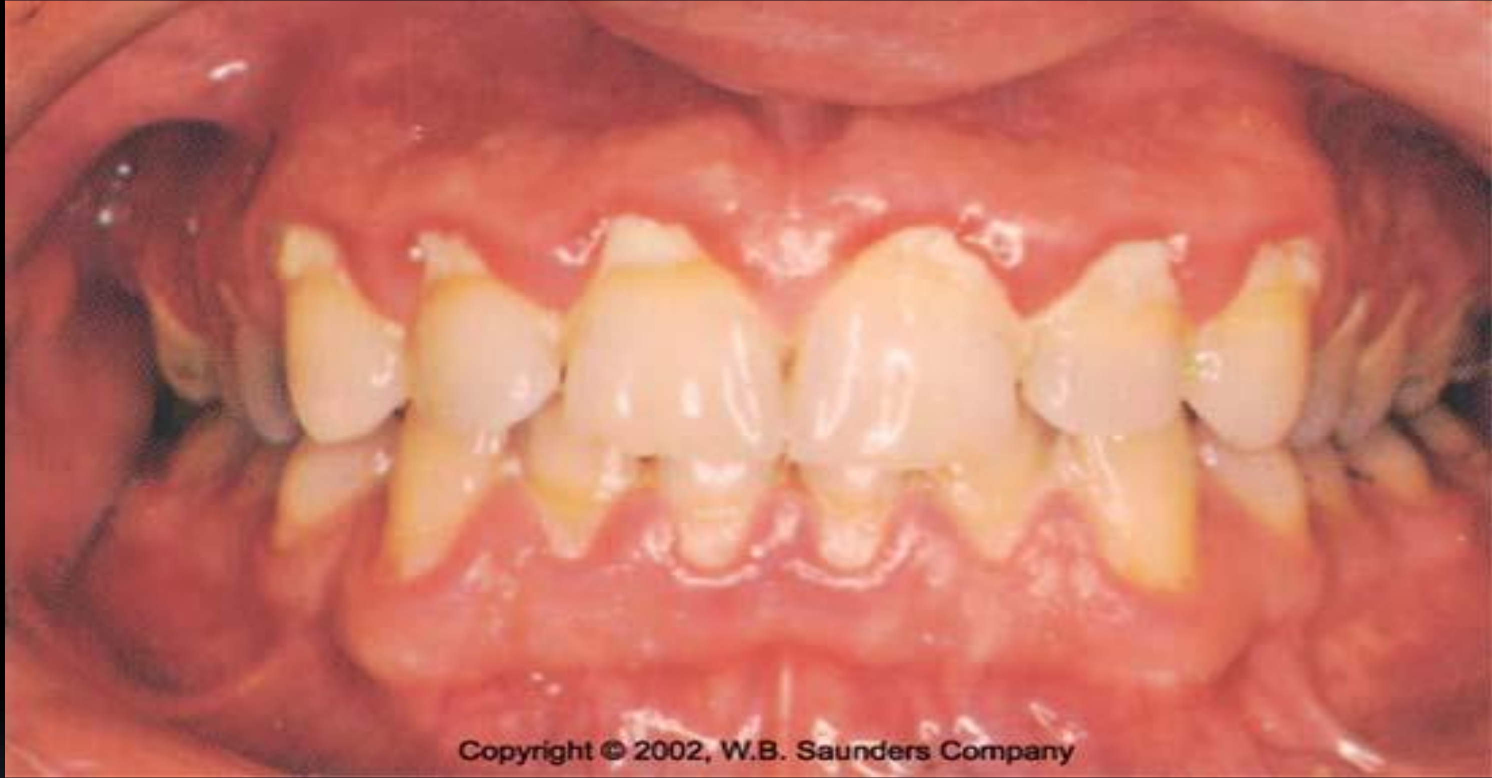
A. Oral Debris (DI)

0: No debris or extrinsic stain.

1: Soft debris covering less than **1/3** of the tooth surface, or ***extrinsic stain without debris*** regardless of the surface area covered.

2: Soft debris covering **1/3 - 2/3** of the tooth surface.

3: Soft debris covering more than **2/3** of the exposed tooth surface.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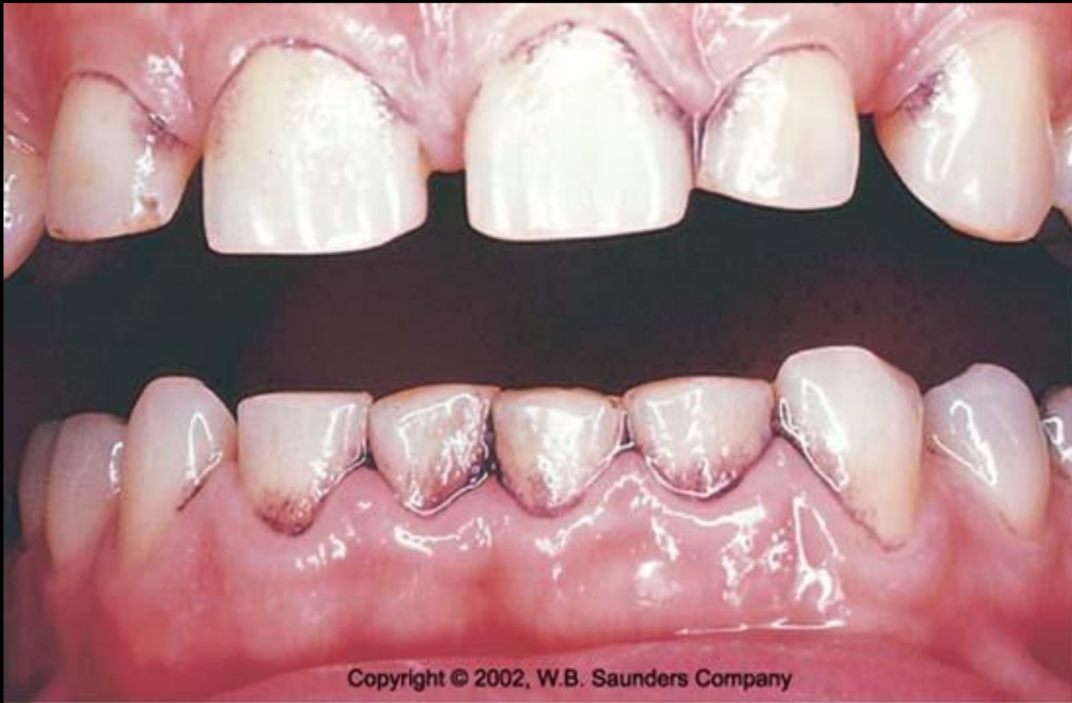
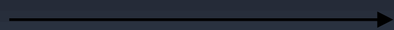
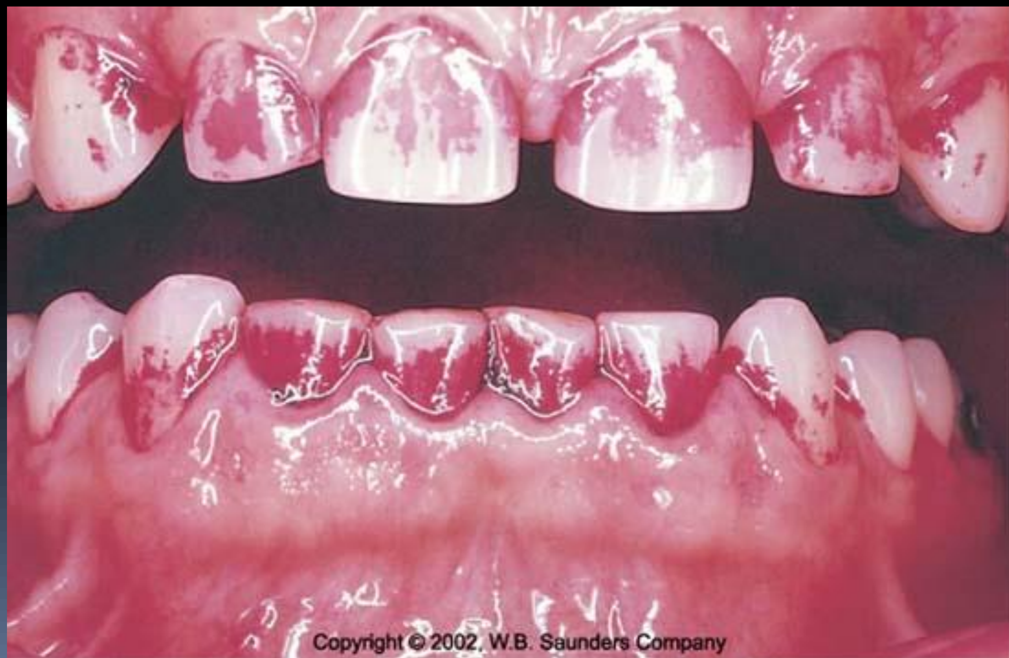


Supragingival plaque
Disclose with dye





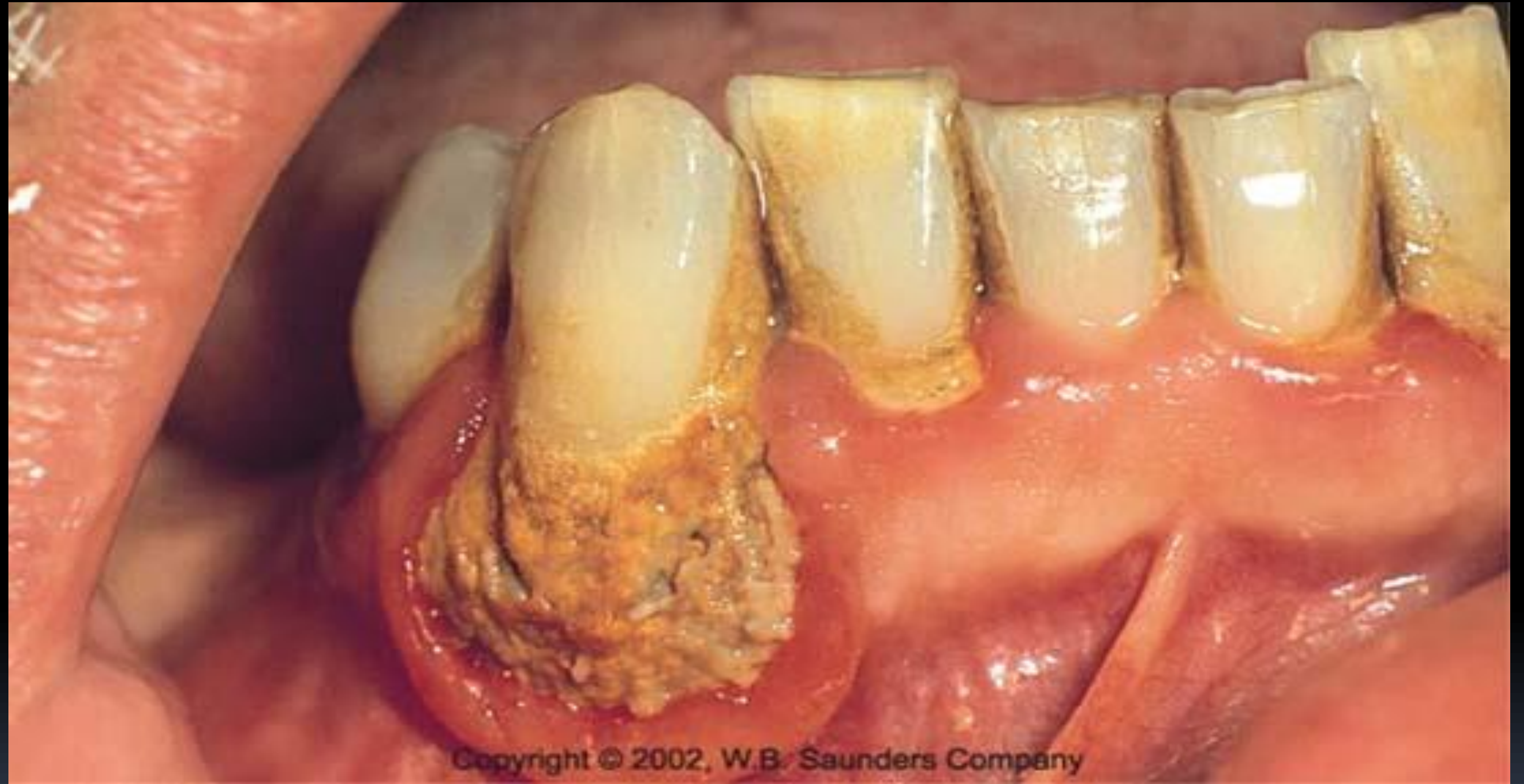
B. Oral calculus (CI):

0: No calculus present.

1: Supra-gingival calculus covering less than **1/3** of the exposed tooth surface.

2: Supra-gingival calculus covering **1/3-2/3** of the exposed tooth surface ***or*** individual flecks of subgingival calculus around the cervical portion of the tooth.

3: Supra-gingival calculus cover more than **2/3** of the exposed tooth surface ***or*** a continuous heavy band of sub-gingival calculus around the cervical area of the tooth.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For determining OHI:

The mean of DI and CI of the examined 12 surfaces is computed and then we sum DI and CI.

N.B. DI equals the summation of the DI scores of the 12 surfaces examined divided by 12 and also CI equals the summation of the CI scores of the 12 surfaces examined divided by 12.

So OHI=DI+CI.

For determining OHI-S:

The mean of DI and CI of the examined 6 surfaces is computed and then we sum DI and CI.etc.

5- Community Periodontal Index of Treatment Need (CPITN) :

Designed for initial screening and for monitoring changes in periodontal needs of the individual of the community. With this information, appropriate oral care service can planned for populations and for individuals.

The CPITN record the ***common treatable conditions***; namely gingival inflammation, periodontal pockets, dental calculus and other plaque retentive factors.

It does not record ***non treatable or irreversible changes*** such as gingival recession.

Thus the term (treatment need) is intended as a guide to the level or magnitude for care when accepted periodontal criteria are followed.

The use of CPITN in epidemiology and in clinical practice:

Mostly used to identify the prevalence and severity of periodontal conditions with respect to treatment needs whether in epidemiological studies or in clinical practice.

Compared with other epidemiological indices for periodontal health (e.g. periodontal index), the CPITN is not only simple and practice but also more objective in its choice of clinical criteria and methodology.

Method of examination

The CPITN probe and probing brocedure:

The CPITN probe (Tactile probe or sensing instrument) is a graduated probe has a ***thin handle*** and of ***very light weight***.

It designed for gentle manipulation of the sensitive soft tissue (extension of the examiners fingers) around the teeth.

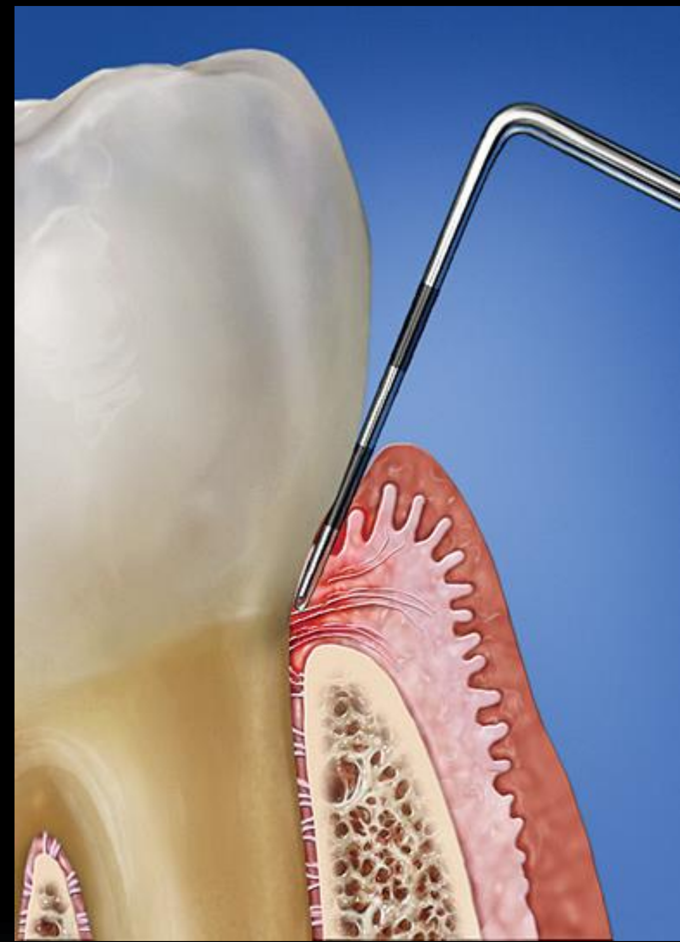
It has a ***ball tip of O.5mm diameter*** that allows easy detection of subgingival calculus.

It measure the pocket depth through colour coding with a ***black mark starting at 3.5mm and ending at 5.5mm***.

This feature, combined with light probe weight, facilitates the identification of the base of the pocket, thus decreasing the tendency for false reading by over measurements.

The probe is inserted between the tooth and the gingiva in the same plane as ***long axis of the tooth*** as possible. The ball end should be kept in contact with the root surface.

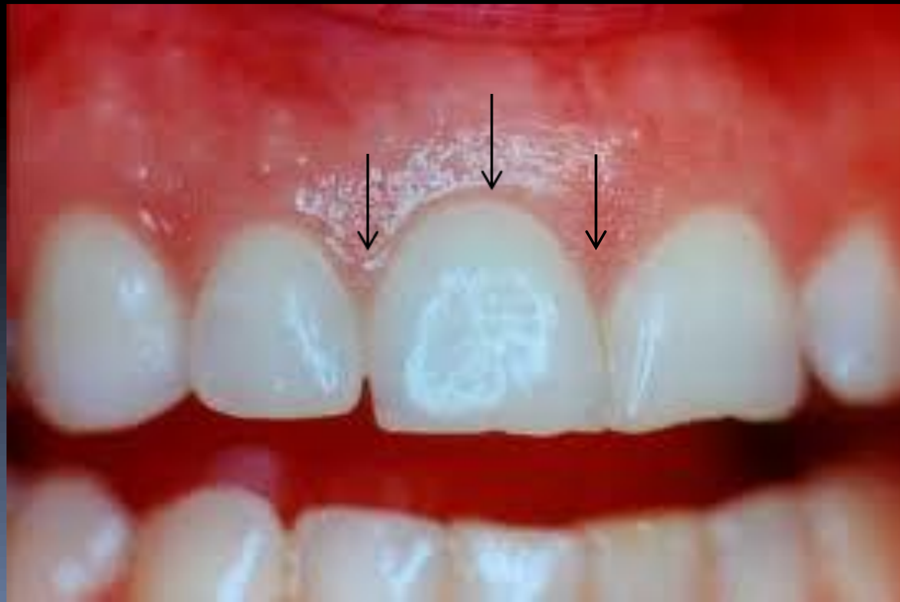
A sensing force is used both to determine the pocket depth and for detecting subgingival calculus.



Pain to the patient during probing is an indication of a too heavy sensing force.

The pocket depth is sensed and read against the colour code.

The sites of probing are ***mesial, mid line and distal*** of both **buccal and lingual surfaces**.



The procedure:

The dentition is divided into six parts (sextants) and each sextant is given a score.

7-4	3-3	4-7
7-4	3-3	4-7

For epidemiological purpose, the score is identified by examination of specified index teeth. while in clinical practice the ***highest score in each sextant*** is identified after examination all teeth.

Third molars are not included, unless they are functioning in the place of second molars.

The treatment need in a sextant is recorded only when 2 or more teeth are present and not indicated for extraction.

The tooth is indicated for extraction when it has vertical mobility and causes discomfort (periodontally affected) to the patient.

If all teeth in sextant are missing or only one functioning tooth remains; the sextant is coded with ***a diagonal line*** through the appropriate box.

Index Teeth for epidemiological studies:

In epidemiological surveys for **adults ,aged 20 years or more**, only 10 teeth, known as the index teeth, are examined. These teeth have been identified by (WHO 1984) as the best estimators of the worst periodontal condition of the mouth. These teeth are :

7-6	1	6-7
7-6	1	6-7

Although ***10 index teeth are examined, only 6 recordings***, one relating to each sextant, are made. The worst finding from these tooth surfaces is recorded for the sextant. If no index teeth are present in a sextant qualifying for examination, all remaining teeth in that sextant are examined and the worst finding is recorded resembling that sextant.

For young people, ***up to 19 years***, only six index teeth resembling the six sextants are only examined, these teeth are:

6	1	6
6	1	6

The ***second molars*** are excluded as index teeth in young ages because of the high frequency of false non-inflammatory pocket associated with eruption.

When examining children less than 15 years, ***pockets are not recorded*** although probing for bleeding and calculus are carried out as routine.

For recording CPITN the following (chart index) is recommended.

Codes and criteria :

Code 0: healthy periodontal tissues.

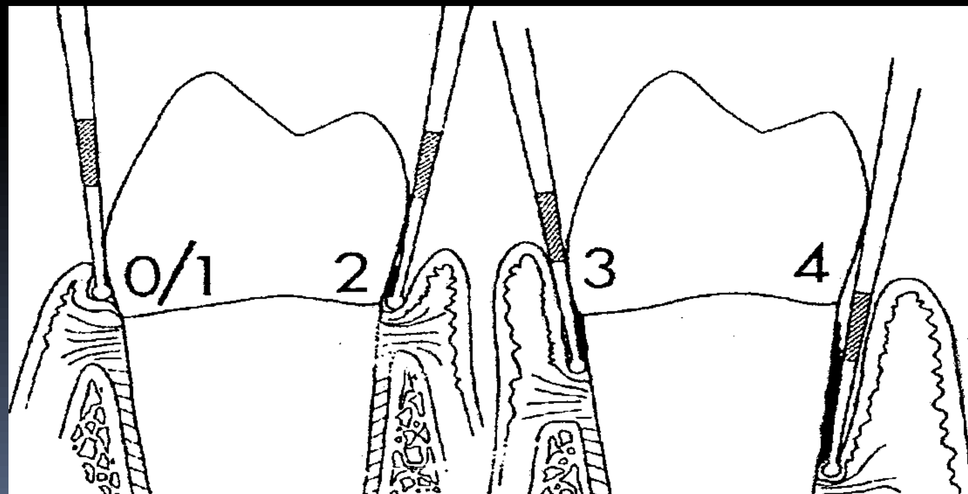
Code 1: Bleeding observed during or after gentle probing

Code 2: Supra- or subgingival calculus or other plaque retentive factors are either seen or felt during probing.

Code 3: Pathological pocket of 4-5 mm , that is, when the gingival margin is on the black are of the probe.

Code 4: pathological pocket of 6 mm or more, that is, the black area of the CPITN probe is not visible.

Code X : when only one tooth or no teeth are present in a sextant (third molars are excluded unless they function in place the second molars) i.e. It is considered as missing sextant and is indicated with a diagonal line. The single tooth, if present, will be included in the adjacent sextant.



Classification of treatment need.

TN 0: For code 0 or X (missing sextant) indicates that there is no need for treatment.

TN 1: For code 1 indicates a need for improving the personal oral hygiene of that individual.

TN 2: (a) For code 2 indicates need for professional cleaning of the teeth (scaling) and removal of plaque retentive factors. In addition, then patient obviously requires oral hygiene instructions.

(b) for code of 3 (shallow to moderate pocket of 4 or 5 mm depth indicates need for scaling and oral hygiene instructions. This will usually reduce inflammation and bring 4 or 5 mm pockets to values of 3 mm or below. Thus sextant of code 3 are placed in the same treatment category as scaling

TN 3: Sextant scoring **code 4** (6 mm or deeper pocket) may or may not be successfully treated by means of deep scaling and efficient personal oral hygiene measures. Code 4 is therefore assigned for complex treatment as **deep scaling**, **root planning and complex surgical procedures.**

Utilization Of CPITN recordings

The CPITN is designed for rapid and practical assessment of various periodontal treatment needs in population surveys and for initial screening of patients attending for regular dental care.

The recording time needed for the CPITN should not exceed 1-2 minutes. The information obtained is illustrated by the following examples.

Case 1

4	2	3
2	2	

There is at least one deep pocket in the [illegible] or more moderately deep pocket in the left posterior sextants of the maxilla. Three sextants have no pocket depths over 3 mm but require scaling. One sextant is missing.

Case 2

1	2	1

The maxilla is edentulous. The lower anterior sextant requires scaling. The mandibular posterior sextant require improved personal oral hygiene.

Case 3

3	0	3
3	1	3

There are moderately deep pocket in all posterior sextants (require scaling). There is bleeding on gentle probing in the lower anterior sextant (a need of improved personal hygiene in this area) and no treatment need in the upper anterior region.

Factors Affecting The Incidence and Prevalence of Periodontal Diseases

I- Host Factors:

1. Age:

periodontal disease has been found to progress steadily throughout life.

Gingivitis is common in the primary dentition, in the teenage the prevalence of gingivitis increases with age.

From age 13 upwards the proportion of persons with periodontal pockets increases and so the number of teeth with bone loss.

2. Sex:

In U.S.A. and Europe, ***the periodontal conditions are significantly better in females than in males***.

In less developed countries the sex difference seems to be absent, or reversed, i.e. ***the periodontal conditions are worse in females than in males, at least after age 20***.

Even when males and females of the same oral hygiene status are compared the females have periodontal disease.

The most possible explanation of this discrepancy is that female in developing countries give birth to many children, and that the frequent pregnancies and lactation periods drain the mother from nutrients.

During pregnancy gingivitis scores increases with a peak in its last months of pregnancy.

There is also marked increases in pocket depth.

Both return to normal values after delivery.

3. Oral hygiene:

There is a strong inverse relation between the severity of periodontal diseases and oral hygiene.

4.Socioeconomic status:

The periodontal conditions improve as the years of formal education increases, and income goes up.

5.Effect of tobacco:

It showed prevalence of ***ulcerative gingivitis*** in young cigarette smokers is dramatic but also simple gingivitis as well as periodontitis with bone resorption increases with increasing tobacco consumption.

This may be due to effect, of the tobacco material itself and the heat derived during smoking.

6.Correlation with general disease:

diabetes
Blood diseases
Hormonal changes

7.Nutrltional factors:

The effect of various ***vitamins*** has been in focus of interest, and they were considered to play a very important role.

Vit C and B12

8. Correlation with malocclusion:

the most important factor in malocclusion is ***crowding of the teeth***.

9- Effect of race

The extreme difference in prevalence and severity of periodontal conditions in ***Asia and Africa*** on one side and ***U.S.A. and Scandinavia*** on the other, suggests at first glance that a racial predisposition may be responsible for it.

Such a difference also exists between ***negro and white*** in U.S.A.

However when education, professional dental care and oral hygiene were kept equal, no clear cut difference was observed.

11- Agent Factors:

The most important factor in the etiology of diseases are ***bacteria*** and ***calculus***.

Calculus: Its an abnormal hard stone-like concretion, varying in color from yellow to black, formed by calcification of dental plaque.
Formed of calcium phosphate and carbonate, food particles and organic matter.

Ill. Environmental Factors:

1. Geographic distribution of periodontal diseases:

It has been found that periodontal diseases are much more prevalent and severe in some ***Asian and African*** countries than in ***U.S.A***.

Some South American countries seem to fall in between these two extremities.

2. Fluoride concentration In drinking water:

periodontal health improves as fluoride intake increases.

However, no statistical data to this effect have apparently been documented.

But this effect may be mainly due to the decrease in number of carious cavities especially cervical and proximal.

3. Oral environment:

a) Prosthetic restoration: Several reports have shown that gingival inflammation, mobility and bone destruction increase in teeth adjacent to partial dentures.

b) Dental caries: There is positive association between DMF scores for caries and scores for gingivitis and periodontitis, although the degree of correlation may vary considerably. Research data fail to substantiate commonly held opinions that there is an inverse correlation between these two dental diseases.